POLICY RESEARCH WORKING PAPER 1768

Is There a Quantity-Quality Tradeoff as Enrollments Increase?

Evidence from Tamil Nadu, India

Does greater access to education come at the expense of educational quality? What public policies can diminish the decline in quality of education when public funds are limited and enrollments are expanding?

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Summary findings

Developing countries have been quite successful at expanding school enrollment, especially at lower levels. But for any given level of educational efficiency, increased enrollments require increased resources, in order to maintain quality. If those resources are not forthcoming, the increase in educational quantity may come at the expense of educational quality.

When public budgets are constrained, is there a tradeoff between quantity and quality of education? If so, what public policies can diminish the decline in quality?

Duraisamy, James, Lane, and Tan find a negative effect of expanded enrollments on school conditions and learning, using a cross-district time series analysis of Tamil Nadu, India. A wide array of initiatives undertaken by the government of Tamil Nadu has made schools accessible and attractive to families. But the resources have not kept up with enrollments and those resources that exist have not always been efficiently utilized. Most notably, the student-teacher ratio has risen dramatically over the past decade. In addition, while many new schools have been started, many of them do not have buildings, or have only meager buildings. The quality of education, as measured by the pass rate on the statewide tenth grade examination, has suffered as a result. The study shows that the rise in the student-teacher ratio and the consequent diminution of the growth rate in examination passes has been greatest in districts with the fastest enrollment growth — evidence of a quantity-quality tradeoff.

Districts with a high proportion of privately-managed schools perform better. Policy changes such as greater use of private management and finance and greater local discretion in publicly-managed schools might improve the situation.

This paper — a joint product of the Poverty and Human Resources Division, Policy Research Department, and the Education Division, Human Development Department — is part of a larger effort in the Bank to understand and disseminate the determinants of educational quality. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Selina Khan, room N8-024, telephone 202-473-3651, fax 202-522-1153, Internet address skhan8@worldbank.org. May 1997. (31 pages)

Is There A Quantity-Quality Trade-Off As Enrollments Increase?

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Expanding access to education, especially at lower levels, is a common objective of governments in developing countries, and it has met with considerable success over the last two decades (see, for example, UNESCO 1993; World Bank 1995). But for any given level of efficiency, increased enrollments require increased resources, in order to maintain quality. Countries may not always take this into account in their educational plans. Does the increase in educational quantity come at the expense of quality? What public policies can raise efficiency or otherwise diminish this quantity-quality trade-off, in the face of strong constraints on public budgets? This paper explores these issues, using Tamil Nadu, India, as a case in point.

We document the sustained and rapid increases in enrollments in Tamil Nadu since the 1970s, in part due to state government policies. However, the expansion has not been an unmitigated success. Because the education system has always depended heavily on public funding, and because these resources did not keep up with enrollments, conditions of schooling, particularly teacher-pupil ratios at the middle and secondary levels, declined sharply. We investigate whether this in turn has had a negative impact on academic performance, as measured by the pass rate on the tenth grade examination.

The limited role that the private sector has been allowed to play has exacerbated the conflict between educational quantity and quality. In Tamil Nadu many schools--21 per cent at the primary-middle levels and 28 per cent at the secondary level--are "aided", that is, set up and run by private management but largely financed by the state, hence a public-private hybrid. While their teacher salaries are paid by the state, the managers are expected to provide the building and other school facilities. In exchange for public funding they give up the right to charge fees, but they retain other managerial rights, such as the right to select their teachers. Fewer than 1 per cent of schools are private, unaided and fee-financed. Therefore, as a secondary question, this paper

analyzes whether quality might be raised by expanding the number of privately-managed schools and by using private finance to loosen the resource constraint for the system as a whole.

We utilize two sources of information: evidence based on aggregate time series data at the district level, drawn from (mostly unpublished) administrative records kept by Tamil Nadu's Department of Education; and evidence based on a field trip to 26 government and private schools in rural and urban areas around Madras and Madurai by three of the authors in July 1994.[1] These visits offered an opportunity for discussion with school heads and teachers and for first-hand observation of actual school conditions. These diverse sources of information led us to conclude that Tamil Nadu was not willing or able to maintain a constant level of public per student funding as enrollments rose through the 1980's, so school conditions, and to some extent learning, fell.

Part I asks, what were the consequences of increased enrollments for school conditions? Part II analyzes the impact on learning, as measured by the growth rate of passes on the 10th grade examination, and evaluates whether this effect differs across districts depending on their use of private management. Part III considers whether greater reliance on private finance might improve the situation. The Conclusion summarizes policy implications.

I. The Impact of Increasing Enrollments on School Conditions

During the past two decades the Tamil Nadu government has adopted numerous measures designed to increase enrollments: setting up a primary school in every village with more than 1,000 inhabitants (the threshold is now being lowered to 500 inhabitants); providing free mid-day meals 365 days a year to every child in primary and middle school; and giving free uniforms and books to every child in

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[1] Although we had a general letter of introduction from the state government, these visits were not announced beforehand. The choice of schools to visit was random in the sense that we stopped at the schools we happened upon along our route; in some places we also asked local people for directions to particular types of schools (e.g. public or private aided or private unaided) we wished to see. No school denied us a visit.

the mid-day meal program.[2] Some measures specifically encourage girls' schooling: special "marriage grants" to those who complete 8th grade; cash awards to headmasters who enroll and retain high proportions of girls from scheduled castes and scheduled tribes; hiring of large proportions of women teachers; and since 1991, stipulating that only women can be hired as new teachers in primary schools. Considerable publicity has been given to the importance of education and literacy, backed up by awards to communities that achieve high enrollment and school completion rates (see Govt. of Tamil Nadu, India 1994 for details on the various initiatives).

That the school system has expanded rapidly during the past two decades is apparent from the data in Table 1. Although the network of primary schools was already relatively developed in 1977 it continued to grow, adding another 2,700 schools by 1992. The gross enrollment ratio at the primary level rose from 93 percent in 1977 to 101 percent by 1992, suggesting nearly universal attendance among recent cohorts of primary school-age children. Coverage also took off after the mid-1970s at the middle school level, followed a decade later by a similar trend at the high school and higher secondary school levels. Thus between 1977 and 1992 age enrollment ratios rose from 57 percent to 96 percent at the middle school level and from 33 percent to 47 percent at the high school and higher secondary levels.[3] The female share of enrollments increased at all levels. The

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[2] The mid-day meal program was initially intended only for children from low-income families. It is now open to everyone, but children from higher income households self-select themselves out of the program. Besides meeting the recipients' nutritional needs, the meals can be viewed as a payment to families to cover the opportunity cost of schooling. The uniforms provided do not always fit and are not always worn, but they do reduce the private cost of schooling to low-income families.

[3] Our data on age enrollment ratios are based on actual grades in which students are enrolled divided by size of population in the relevant age group. However, our data on number of students and teachers are based on category of school in which students are enrolled. Schools in Tamil Nadu are categorized according to the highest grade that they offer. Since some middle schools began to offer higher grades during this period, they became recategorized as high schools, and since many students in middle school grades attended schools categorized as high schools, the growth in high schools and high school students appears much larger than the growth in age enrollment ratios at the high school level, and vice versa at the middle school level. The age enrollment data give the better picture of enrollment coverage for each group of potential students. See Table 1 for

Appendix presents evidence on the degree to which this enrollment expansion was due to state policies versus exogenous family circumstances.

The focus of this study is the degree to which these enrollment increases were accompanied by worsening conditions of schooling, and the consequences of this deterioration, as public spending on education, particularly on teaching resources and physical facilities, did not keep up with the growth in student numbers.

Teachers and class time

While enrollments at the primary and middle school levels expanded by 35 percent between 1977 and 1992, the number of teachers increased only 4 percent in the same period. Inevitably, the ratio of pupils to teachers rose--from 36 in 1977 to 47 in 1992 (Table 2). By 1992, pupil-teacher ratios in primary and middle schools across districts ranged between 39 and 54.

At the high school and higher secondary levels the pattern of growth in numbers of pupils and teachers was even more striking (Table 3). Between 1977 and 1992, enrollments rose by 139 percent, reflecting substantial increases in continuation rates to secondary education, while the number of teachers grew only 44 per cent. Consequently, the pupil-teacher ratio rose from 25 to 42, an increase of 66 percent. On average, for every 1 percentage point increase in number of students since 1977, there was only a 0.11 percentage point increase in number of teachers at the primary and middle school levels and a 0.32 percentage point increase at the high school and higher secondary levels. At all levels, pupil-teacher ratios in Tamil Nadu are among the highest in the world today (see UNESCO 1993 for data on other countries).

The rising pupil-teacher ratio has been exacerbated by the differential rate of enrollment growth across districts and the fact that teacher allocation has not responded to these differences, so districts with the fastest growing enrollments also had the fastest rising pupil-teacher ratios (Table 3). For example, enrollments in primary and middle schools increased 44 per cent in Chengalpattu district between 1977 and 1992, compared with 25 per cent in Salem.

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further explanation.

But the number of teachers increased at almost the same rate in these 2 districts--5 and 4 per cent, respectively. As a result, the pupil-teacher ratio rose 37 per cent in the former, ending up at 51, while it rose only 19 in the latter, ending up at 45. Between 1977 and 1992, secondary school enrollments more than tripled in Dharmapuri but less than doubled in Kanniyakumari, while teachers grew at the same rate--about 54 per cent--in both districts. As a result, the pupil-teacher ratio more than doubled in Dharmapuri, to 50, but it grew only 25 per cent, to 32, in Kanniyakumari. In this paper we exploit these district differences, which become the basis for the regression analysis that is described in the next section.

One reason for the slow growth in number of teachers is the fact that the salary scale for government-paid teachers is far above the market rate (in some private unaided schools that we visited, teachers were paid only one-quarter as much as government-paid teachers), and that cost-of-living adjustments are built into the salary scale. Thus, most of the increase in available public funding has gone to a relatively constant number of teachers in the form of salaries and salary increases, rather than to a larger number of teachers.

High pupil-teacher ratios mean that students attend classes in very large groups. In some districts visited by the authors, groups of 60 to 100 students are commonplace. In secondary schools teaching resources are especially constrained because teachers work only 24 periods (18 hours) a week, while students are present for 34 periods. Thus, the nominal pupil-teacher ratio overstates the effective class size by about 40 percent. For example, if there is one teacher for every 50 pupils, the average class size would be 70, not 50, because each teacher only teaches for 70 percent of the full day.

The sparseness of teaching resources per student is compounded by other factors that reduce effective teaching time, such as:

- *The slowness to fill teaching vacancies when they occur due to retirement or transfer.* Headmasters in public schools do not have the authority to hire but must wait for the Recruitment Board in Madras (the state capital) to send replacements. This process can take a year or longer,

particularly during periods of budget stringency at the state level. Many of the schools we visited had at least one vacant position.

- *The lack of substitute teachers to cover for absent teachers.* When a teacher is absent, the class (of 50-100 students) is merged with another class or sits by itself. Teachers are eligible for 14 days of "casual leave" annually, which is 6.5 percent of the school year. In addition, a 3-month paid maternity leave is allowed, as well as 18 months of sick leave over a teacher's career (which teachers usually take toward the end if they haven't already used it up earlier). Thus, one can expect a career teacher who works for 30 years, has 3 children and takes full sick leave and "casual leave" (as most do) to be absent an average of 34 days a year, or 16 percent of total school time. At most schools visited by the authors, the rate of absenteeism plus vacancies ranged between 10 and 20 percent.
- *The participation of teachers in non-teaching activities.* Teachers are expected to perform numerous other duties which cut into teaching time. For example, they are expected to help collect data for the census, assist in elections, and show up for in-service training. Other non-teaching activities cause teachers to arrive late or depart early, and additional time is lost to teacher strikes and political agitation. In 1993, for example, public school teachers were on strike for 2 months, and schools simply closed during that time.

Privately-managed aided schools seem to have an advantage in retaining and utilizing the services of their teachers. First of all, their managers choose their teachers and can select people they judge to be conscientious, rather than simply accepting teachers who are assigned by Madras; at least in principle, they can also fire ineffective teachers. Second, when a teacher leaves, the vacancy can be filled immediately at the discretion of the school manager, even though the state pays the salary. Thus, aided schools are less likely to have vacant positions than are public schools. Third, absent teachers can be replaced using resources provided and at salary scales determined by the school's management;

in our field visits we observed fewer missing teachers and classes without teachers in aided schools. And fourth, teachers in aided schools are likely to spend less time in out-of-school activities.[4]

In sum, the teaching input per student has been declining, even that small input is missing over 20 percent of the time, but less so in privately- than in publicly-managed schools, and political economy forces that keep public school teacher salaries relatively high have added to the problem. It is hardly surprising that rote learning is emphasized under these circumstances, both in the classroom and in the examinations. Given the on-going debate about the importance of resources versus pedagogical processes, it is worth noting that to some extent the latter is constrained by the former, making pedagogical improvement difficult in Tamil Nadu.

Buildings and other facilities

The government of Tamil Nadu has been very successful in starting new schools, so that practically every village has a primary school and easy access to a middle and secondary school as well. But many of the schools have no buildings, which means that lessons are held outdoors, on the ground, and are suspended whenever it rains, perhaps 5 percent of the time. This is yet another way in which teaching time is lost. Even in schools with buildings, the typical arrangement consists of one large unfurnished classroom, sometimes divided into several sections by partial partitions, each section accommodating 50 to 100 students. Tables and chairs are lacking and most students sit on the dirt floor for their lessons. Most schools we visited did not have lavatories. On average, 40 percent of Tamil Nadu's primary schools in the rural areas have no building or only one room, and nearly a quarter of the classes lack a blackboard (Table 4). Many of these one-room schoolhouses have only one teacher.

It is hardly surprising, given these difficult conditions, that the high rate of teacher absenteeism is more than matched by the students: in some of the

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[4] In most of the aided schools visited by the authors, conditions and discipline were visibly better than those in government schools. All the private unaided fee-charging schools visited were equipped with tables and chairs and classes contained fewer than 40 pupils.

schools visited by the authors, students absenteeism ranged as high as 25-50 percent. In this sense, the enrollment data overstate the actual number of students days, by 35-100 percent. It is perhaps more surprising that students remained enrolled in school despite these poor and declining conditions (see Hanushek and Lavy 1994 for a study of enrollments in Egypt, a case where students were found to have dropped out because of poor quality education.)

II. What Has Been the Impact on Examination Results?

To what extent has the decline in school conditions adversely affected student learning? Can policies be adopted that would minimize these adverse effects, despite the tight public budget constraint? Ideally we would examine these issues using individual-level time series data on achievement scores and student characteristics.[5] Such data are unavailable in Tamil Nadu, however, so we rely on time series district-level data, using the results on the state-wide tenth grade public examinations as a proxy for learning outcomes.[6] The many generic problems with the use of such an exam as an outcome indicator include the fact that it may measure rote learning rather than analytic skills, and grading standards may differ across districts and time periods. In this case examination papers are graded centrally, implying that the same standards were applied across all districts. It is possible that grading standards have changed though time, thereby raising or depressing the number of passes; however, this effect would be picked up by the time trend included in the regression analysis and the cross-district regression analysis presented below should remain valid.

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[5] Bashir (1994) is a rare example of a study using achievement data for individual students in Tamil Nadu. Her study focused on cross-sectional differences in achievement outcomes between public and private schools rather than on changes in achievement over time. Kingdon (1996) also uses individual student data to compare standardised achievement differentials between students of private and public schools in Uttar Pradesh.

[6] Students also sit for state-wide examinations at the end of the twelfth grade. Because the available data for these examinations refer to a relatively short time series of four years, we focused only on the data for the tenth grade examination.

Many recent studies have shown that expenditures per student are not a good predictor of school performance (Hanushek 1986 and 1994), so we might expect the deteriorating school conditions in Tamil Nadu to exert only a negligible adverse on examination results. But few of the studies pertain to situations where resource levels are very low and where changes have been as dramatic as those observed in Tamil Nadu.

Between 1977 and 1992 the number of candidates for the tenth grade examinations grew by 73 percent for the state as a whole, from a base of nearly a quarter million candidates (Table 5). During the same period the number of passes rose by 118 percent, lifting the pass rate from 54 percent in 1977 to 69 percent in 1992. Much of the improving trend in pass rates reflects the above average performance of the increasing proportion of female candidates.

These aggregate patterns would seem to suggest that the deteriorating conditions of schools in the state did not hold back examination performance. But it is also possible that the effect of deteriorating school conditions was negative and offset by other factors such as secular improvements in parental education and nutritional status of the children. In other words, had school conditions not deteriorated, examination outcomes might have been better still. We use cross-district regression analysis below to estimate how much better performance would have been.

The model and data

We model growth in tenth grade examination passes as a function of growth in candidates, changes in schooling conditions as proxied by the pupil-teacher ratio, the prevalence of privately-managed schools in each district, as well as a time trend to proxy systematic changes over time in, for example, social norms on schooling, parental education levels, children's nutritional status, labor market incentives and grading standards on the examinations. In an alternative specification we replace the private school variable with district dummies to capture all systematic differences across districts, including differences in the distribution of schools by management type. Data limitations precluded expansion of the regression models beyond this set of regressors.

Our data pertain to time series information for 15 districts during 1977 to 1992 culled from administrative records kept by the Government of Tamil Nadu.[7] We transform each variable (enrollments, teachers, candidates and passes) into an index based on its 1977 level, to facilitate comparisons over time across districts which vary widely in population size. mO focal point is the impact of the pupil-teacher ratio on educational performance. We note that each cohort's examination performance reflects the cumulative effects of past schooling conditions. Because students were exposed to middle school conditions for three years but high school conditions for only one year before taking the examination, we use the pupil-teacher ratio for middle school (grades 6-8), appropriately lagged, for each year of examination data. For the reasons elaborated earlier we expect this variable to have a negative effect on learning.

As an indicator of the prevalence of private management, we used the percentage of private aided schools in the district. We expect this to have a positive effect, in light of the greater flexibility that private schools have in Tamil Nadu (see above), as well as findings from recent studies suggesting that privately-managed schools achieve greater efficiency or academic value-added than publicly-managed schools (Jimenez and Lockheed 1995; James, King and Suriyadi,1996). This positive measured effect may occur because decision-making in privately-managed schools is less bureaucratized, more localized, closer to the locus of information about school processes (a true value-added), but it may

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[7] The time series refer to the following years: 1977, 1980, 1983, 1986, 1988, 1989, 1990, 1992. Data for the more recent years refer to 23 districts, some of which existed previously as combined districts. Because the data for earlier years are available only for 15 districts, we amalgamated the data for the newly created districts to produce a complete time series for 15 districts for our analysis. The available data show the number of students and teachers in primary, middle, high and higher secondary schools. Because many schools offer the full range of grades, from kindergarten to higher secondary grades, the data do not correspond exactly to a breakdown by grade or cycle of education. For example, a child attending the primary wing of a high school is counted as a high school student in this data set. To minimize the effect of this problem in our calculation of student/teacher ratios, we use the same classification system for teachers. The data contain information on the composition of schools by type of management, as well as the number of candidates taking and passing the state-wide public examinations at the end of the tenth grade.

also be an artifact of an unobserved selection process in which private schools attract students with higher ability and motivation and weed out the others. In this analysis, which uses district pass rates and district proportions of private schools, selection bias is minimized because it can only operate through attracting better students from other districts, or getting students to drop out of any school in the district before they become candidates.

In Tamil Nadu the share of schools that are privately-managed varies widely across districts but has remained relatively stable within each district in the period under analysis (see Appendix Table 3). As a result the variable for private schools is almost collinear with the district dummies, and we could not use it together with the district dummies in the same regression. District dummies capture the influence of private management as well as that of other factors such as the increased number of students from disadvantaged backgrounds who reach the tenth grade, sit for the exam, and ultimately fail, possible differences in grading standards across districts (unlikely, as noted above), variation in social norms and so on. Note that to the extent that these effects are uniform across villages, they will be picked up by the time trend rather than the district dummies. Because the district dummies capture managerial capacity plus a wide range of other effects, they should have greater predictive power than managerial type alone, although with less specificity about the forces at work.

We control for growth in the number of candidates over this period, which would normally have a strong positive effect on the growth in number of passes. Ideally we would have used the growth in number of ninth grade students, instead of candidates for the examination, as the independent variable for predicting growth in examination passes. This would minimize the effect of selection bias associated with the likelihood that schools encourage only better prepared students to sit for the examinations, an effect that may differ across villages

and time. However, information on enrollment by grade was not available so number of candidates was used.[8]

In a separate equation we explain growth in number of candidates as a function of growth in enrollments at the high school and higher secondary levels, the prevalence of privately-managed schools (or, alternatively, district dummies), and a time trend.

The results

The regression results appear in Table 6. Not surprisingly, the growth in passes at the tenth grade examinations depends mainly on the growth in examination candidates: a 1 percentage point increase in candidates results in a 0.99 percentage point increase in examination passes (all relative to 1977). The growth of candidates, in turn, is a function of the growth in enrollments: a 1 percentage point increase in upper school enrollments (i.e. in high school and higher secondary school) produces a 0.72 percentage point increase in candidates. These results suggest that policies aimed at getting students into school and keeping them there will have the most powerful effect on the stock of examination passes.

Most important for our purposes, pupil-teacher ratios do indeed exert a negative influence on examination passes: holding number of candidates constant, every additional pupil in the class held back the growth in passes by 1.2-1.5 percentage points, depending on specification. Between 1977 and 1992, the state-wide average middle school pupil-teacher ratio rose by 12 pupils, from 35 to 47. According to our regression estimates, the number of passes on the tenth grade examinations in 1992, relative to the number in 1977, would have been 15-18 percentage points higher if the 1977 pupil-teacher ratio had been maintained.

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[8] Because students attending grade 9 are spread across institutions which are labelled as middle, high, and higher secondary schools, it is not possible to compare the number of candidates directly to the number of ninth grade students. The number of candidates grew much slower (73%) than enrollments at the high and higher secondary levels (139%). This was partly due to the fact that enrollments categorized as secondary in fact included an increasing number of students who were actually sitting in middle school grades. It may also have been due partially to increased selectivity in continuation from middle to high school grades or in exam takers among those attending high school grades. The available data do not enable us to disentangle these explanations. Also see footnote 3.

That implies the percentage of candidates passing the examination in 1992 would have been 73 percent instead of 68 percent (see Figure 1).

As noted above the pupil-teacher ratio is subject to substantial measurement errors, implying that its regression coefficient is likely to be biased downward in absolute value. In addition, if increased selection occurred in districts with high and rising pupil-teacher ratios, this too would have biased downward its coefficient. Offsetting these two negative biases is the positive bias stemming from the possibility that districts with rapidly rising enrollments and pupil-teacher ratios are recruiting students from less privileged backgrounds, where accumulation of human capital in the household is lower. Unfortunately, we do not have the data that would be needed to test for or eliminate these possible biases. On balance, the available evidence implies that enrollment growth has had the primary impact of increasing the number of students who take and pass the exam, but the concomitant decline in school conditions, as reflected in dramatically rising pupil-teacher ratios, has had a partially counteracting negative effect on student performance.

Also as expected, the distribution of schools by management type affects performance across districts: a 1 percentage point rise in the proportion of aided schools increases the growth rate of passes by 0.22 percentage point. Thus, if we compare Periyar-Coimbatore, where 29.5 per cent of the secondary schools are privately-managed aided or unaided, with Pudukottai, where only 13.5 per cent are in this category, the expected number of examination passes in each year relative to 1977 would be 3.5 percentage points higher in Periyar, *ceteris paribus*. If this is true value-added, it suggests that some practices of aided schools, such as the right to select their own teachers (subject to state standards), to hire substitute teachers and to fill vacancies expeditiously, may contribute to their effectiveness and should also be extended to public schools.

Over-all, our regression results suggest that there is a quantity-quality trade-off if public budgets are constrained, and policies aimed at improving efficiency through choice of managerial type will improve examination outcomes as enrollments increase.

III. How Can Private Resources Augment Public Resources?

The decline in school conditions, with its adverse effects on achievement, arises in part because the education system in Tamil Nadu depends predominantly upon government funding and government funding has become increasingly scarce. Until recently, the state government did not permit augmentation by private resources. Fees were not allowed in public or aided schools and even voluntary contributions were prohibited.

These restrictions are found in many countries in public and private subsidized schools, as a condition for government aid (James 1991). In most cases the ostensible rationale for prohibiting fees and contributions is equity--wealthier families or communities should not be allowed to secure better quality education for their children by paying. A related political economy rationale is that many low and middle-income families do not have a high effective demand (i.e. a willingness to pay) for incremental quality, do not want the market to push up the price of schooling for them, and do not want others to gain a competitive advantage in the labor market by attending schools that provide better quality through private finance. Their political clout results in the restrictions on fees and contributions (see James 1993, for a more rigorous cross-country analysis of the political economy of government spending on education).

At the same time, above-market salary scales have often been set for government-paid teachers, who are a well-organized politically articulate group. In Tamil Nadu, as we have seen, the result was a resource base that failed to keep pace with enrollment growth, with most of the monetary increase going to teachers in the form of higher wages.

One way out of this situation is to increase public spending on education. But in many cases the inability to pay on the part of low income groups, and the unwillingness of high income groups to subsidize them, limits the political feasibility of this option. Another way out is to tap private resources and to allow these resources to be used to hire additional teachers through the private

market. This increases the total resources used for education and may also increase the efficiency with which these resources are transformed into academic outputs (James and King 1996, Jimenez and Paqueo 1996). In recent years, perhaps because school conditions have now sunk so low that middle class support has shifted, the government has indeed begun to institute such policies.

For example, fee-charging schools are now permitted to open freely, and the number of publicly financed aided schools is no longer expanding. "Matriculation schools", which are self-financed English-medium schools, are by far the fastest-growing part of the education sector. Privately-financed unregistered schools have also been growing, especially at the primary level. These avoid the high costs of registration, which requires posting a bond. Their students switch to recognized matriculation schools at grade 6, when attending a recognized school becomes more important.

The government has also introduced measures to mobilize private contributions in publicly financed schools, effectively lifting a previous ban on such contributions. Among the new policies:

- Parent-teacher and mother-teacher organizations have been set up in each school, and donations of up to 25 rupees per family are encouraged. For a school with 1,000 students, the yield would be 25,000 rupees a year, enough to pay for 2 or 3 additional teachers.
- Schools can collect donations from private benefactors under the "School Improvement Conference." Donors who contribute 1,000 rupees or more are honored as school patrons, and their contributions are put into bank accounts whose interest can be spent by the school. In-kind donations of furniture and materials are also encouraged. These two measures will increase the discretionary funds and consequently the managerial control of some public schools.
- Using these funds, retired or unemployed teachers can be hired to substitute for permanent teachers on leave or for absent teachers, for "honoraria" that are only a small fraction of the regular pay scales. Unemployed teachers are encouraged to participate by giving them credit

for this experience when they apply for a permanent job. This is a way of overcoming the relatively high permanent salary scales for government-paid teachers.

- Government and aided schools are required to charge fees for English-medium instruction, which is very popular. In government schools the fees must be turned over to the public treasury. It remains to be seen whether the revenue will be plowed back into education and whether government schools will have the incentive to start these streams.
- Aided schools are permitted to start an English-medium stream on a self-financing basis. The stream would use the school facilities as a second shift, thereby obtaining more intensive use of capital, and teachers would be paid out of fees.
- Still missing are more far-reaching changes that would give publicly-managed schools control over the selection of their teachers and the right to hire substitutes and fill vacancies without waiting for Madras to act.

This two-pronged policy adopted by the government--allowing more fee-financed private schools to operate and mobilizing private contributions in government-financed schools--has the potential to arrest the deterioration in school conditions. Presumably parents are willing to pay fees and contributions only if they feel the value of the quality improvement exceeds the cost. If parents have the information to make this evaluation reasonably well, and if public spending is not cut back further, these policies may raise average educational quality.

IV. Conclusion

What can other countries learn from the Tamil Nadu experience? Government policies that make schools accessible can increase enrollments, and this is a first major step toward increasing academic achievement. However, if public resources do not increase with student numbers, school conditions and academic achievement will suffer. In many cases governments do not take this cost into

account, resulting in large increases in the pupil-teacher ratio that are detrimental to learning. In the face of tight budget constraints, there is a quantity-quality trade-off. This trade-off can be minimized by giving more discretion over resource use to publicly-managed schools, permitting privately-managed schools to develop and increasing private finance both in public and private schools.

But any system that permits variability in finance and management is also likely to benefit disproportionately those groups that were more advantaged to begin with, and are therefore in a better position to pay and to choose the best management. Thus, the same measures that improve average quality will also increase disparities in quality, unless counter-acting actions are taken by the state, such as reallocating public funds to poorer districts where families are less able to provide private finance. Such reallocation is limited by the unwillingness of higher income groups to redistribute and by the possibility that it will create a disincentive for communities to generate their own private funds. It is especially limited in the short-run because it depends on the redeployment of teachers who are already on the payroll. It will be a challenge for Tamil Nadu to devise mechanisms for constraining the inequalities that develop, as it adopts policies designed to increase quality over-all and reduce the quantity-quality trade-off in the face of rapid educational expansion.

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Appendix: Did State Policies Increase Enrollments?

To what extent is the success in expanding enrollments due to variables associated with individual families, such as the income and education of parents, and to what extent is it due to policy variables such as the decision of the state government to make schooling more accessible? The National Sample Survey (NSS) of households in 1986-87 throws light on this question, by enabling us to determine what factors influenced household decisions regarding the education of their children.[9]

The model and data

We use households rather than individual children as the unit of analysis because we believe that decisions about schooling, especially for children in the ages considered here, are made by parents, and that the decisions are made jointly for all the children in the family (Becker 1981). For our regression analysis we capture households' schooling decisions by defining four alternative dependent variables: among families with children aged 8-17, the proportion of children in each family who were ever enrolled in school; among families with children aged 13-17 the proportion of children in each family who completed grade 5 (primary school); among families with eligible children aged 13-17, the proportion of children who attended post-primary school; and among families with eligible children aged 16-17, the proportion who Standard 10.[10] The dependent variables can thus be interpreted as the probability of school attendance or completion within families.

We divide the independent variables affecting households' schooling decisions into three categories:

(1) Family characteristics, as captured by the number of children in family, proportion of children who are male, father's and mother's education, whether the household is part of an extended or nuclear family living arrangement, and average household consumption per adult. We expect larger families to send a smaller proportion of their children to school, because of the quantity-quality trade-off that has been made by these families; households with

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[9] The survey administered two sets of questionnaires, one for households and the other for villages. The household questionnaire collected information on the economic and demographic characteristics of the household and its members, and detailed information on the education of children aged 5 to 17 (for example, enrollment status, grade attained, expenditure on schooling and benefits received). The village questionnaire solicited information on the availability of and distance to the nearest schools and other social services.

The Survey sampled households using a two-stage random sampling procedure covering all districts in the State except Madras. In the first stage villages were selected with a probability proportional to their population size. The households in the sampled villages were then listed and divided into two sub-strata, the first consisting of households with one or more children enrolled at the post-primary level, and the second consisting of all the remaining households. Three households in each sub-stratum were randomly sampled. In total, the survey covered 2,880 households in 480 villages in all districts of Tamil Nadu. We ran our regression analyses with each household unweighted and weighted to take account of its representation in the entire population. Both methods yielded similar results. Because the interpretation of weighted results is ambiguous, we present the unweighted results in this paper.

[10] Eligible children are those who have completed grades 5 and 9, respectively.

more boys to send a higher proportion to school, reflecting a well-documented social bias; parental education to have a positive effect on child education, since educated parents are more aware of the returns to schooling and more able to help the child with school work at home; and families with higher levels of per capita consumption to educate more of their children, because they have the resources to do so.

(2) Village characteristics, as reflected by the average educational attainment of men and women in the village, average schooling expense (fees, transportation, uniforms, books) per child, and proportion of children receiving free school meals. All these variables, in fact, represent a mixture of exogenous village circumstances and policy choices. For example, average educational attainment in the village is due in part to state policies adopted 20-30 years ago, that may have raised the educational attainment of its current adult inhabitants. We expect this village variable to have a positive effect on the family's decision about schooling, because it is likely to determine the social norm to which individual families adhere. High average schooling expense per child may reflect a lack of supply of convenient good quality publicly financed schools (a policy variable that would have a negative effect on enrollment decisions), but it may also reflect a high taste for education in the village, which would have a positive impact on enrollment decisions. Since we do not have instruments to distinguish between these two causes, the net effect is ambiguous. Similarly, the proportion of children receiving free school lunches across the state reflects the availability of these lunches, but differences across villages probably are associated with students' socio-economic status, since lower income students tend to select themselves into the school lunch program while others eat food supplied by their families. Therefore the net effect here is also ambiguous, although we expect the negative impact stemming from the signal about socio-economic status to dominate in cross-village analyses. In some regressions we included average village per capita consumption expenditure as a regressor instead of adult educational attainment, with which it is highly correlated. We also included district dummy variables to capture the influence of other local characteristics that may matter, such as religious composition, per capita income, adult literary rates, general availability of public services in the community, and so on.

(3) Government policies, as captured by two variables: distance to the nearest school and whether the nearest school is public. In contrast to village characteristics these variables can be interpreted as pure policy interventions reflecting school placement decisions by the government. Pitt and Rosenzweig (1994) treat placement decisions as endogenous but limitations in our data prevented us from using the same model specification; we therefore follow the usual practice in the literature by treating them as exogenous variables. We expect greater distance to have a negative effect (Duraisamy and Malathy 1990; Lavy 1992; King and Lee 1987; Sathar and Llyod 1994). Proximity to a public rather than a private school might lead to higher enrollments because of its lower cost or lower enrollments because private schools are perceived as offering better quality.

In our estimations we use generalized least squares, correcting the standard errors for heteroskedasticity using Huber-White's method. We expect the independent variables to have more explanatory power at the middle and high school levels, because by 1986-87 most children in the state had some primary school education.

Results

As is common in studies on school enrollment decisions, family characteristics dominate in explaining the variation households' schooling

decisions.[11] The regression results are consistent with most of our *a priori* expectations (Appendix Table 1). Larger families send a smaller proportion of their children to school, especially to postprimary school. Households with more boys send a higher proportion of their children to school, an effect that intensifies as the level of education under consideration rises. Parental education also has a positive effect on the proportion of children educated; this effect becomes more important with rising levels of child's education. As expected, rising household consumption per adult increases the proportion of children attending or completing school, and the effect is stronger at higher than lower levels of education. Since family size has been decreasing while parental education and household consumption have been increasing, we would expect a secular rise over time in enrollment ratios, due to these changing family circumstances.

With regard to the village-level variables, the education of men has the expected positive effect on children's education, but the effect materializes only at the lower levels. Women's education has a smaller effect-- possibly because, in this village-level analysis, women have a more limited role in establishing social norms with regard to children's schooling. Other village-level variables have weak effects, possibly because of the ambiguities noted above. Among the policy variables, distance to nearest school plays a significant role at the primary level. Clearly, proximity to a school influences the enrollment decision, so the State's policy of making schools readily accessible undoubtedly deserves some of the credit for the rising enrollment ratios.

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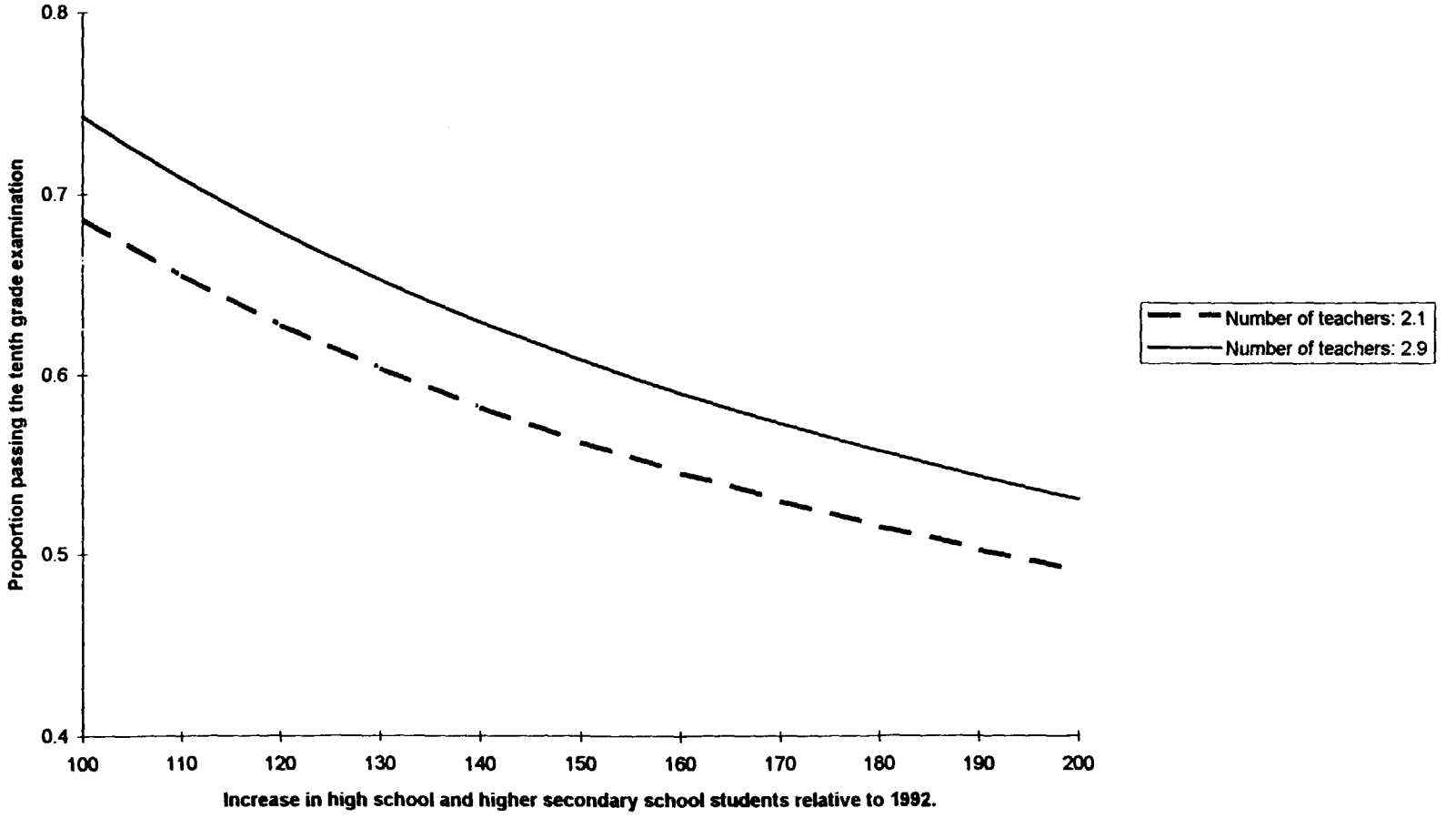
[11] The R^2 statistic dropped by no more than 0.03 points when the policy variables were excluded as independent variables in the regression equations.

Figure 1. Quantity/Quality Tradeoff



The dashed band simulates increasing enrollments holding the number of teachers at the initial 1992 level. The solid band holds the number of teachers at the 1977 level.

Table 1: Trends in Numbers of Schools and Students and in Gross Enrollment Ratios in Tamil Nadu, 1977-92

	1977	1983	1988	1992
Number of Schools				
Primary	27,395	28,546	29,359	30,098
Middle	5,698	5,635	5,707	5,608
High Sch. & Higher Sec.	2,911	3,442	3,819	4,111
Number of Pupils				
Primary	4,144,270	4,761,549	5,362,652	5,672,111
Middle	2,436,108	2,715,549	2,980,365	3,117,891
High Sch. & Higher Sec.	1,718,297	2,392,951	3,228,323	4,106,082
Gross Enrollment Ratio a/				
Primary	93	98	101	101
Middle	57	69	86	96
High Sch. & Higher Sec.	33	32	40	47
Girls as a Percentage of				
All Pupils	44	45	46	46
Primary	43	44	45	45
Middle	38	38	41	42
High Sch. & Higher Sec.				

Sources: unpublished administrative records supplied by the Department of Education, Government of Tamil Nadu, India, supplemented by Govt. of Tamil Nadu (1991 and 1994).

Note: Primary education refers to grades 1-5, middle school refers to grades 6-8, high school refers to grades 9-10, and higher secondary school refers to grades 11-12. Before 1978-79 higher secondary education did not exist as a separate cycle but as part of high school. To maintain comparability in the time series we show the combined data for high school and higher secondary school. In Tamil Nadu schools are categorized according to the highest grade that they offer. Thus, a school that offers grades 1-10 is categorized as a high school in Table 1, and all its students are categorized as high school students.

a/ The gross enrollment ratio is defined as the number of students enrolled in a given cycle divided by the population in the official age group for the cycle. The age groups are 6-11 for primary education, 11-14 for middle school, 14-16 for high school, and 16-18 for higher secondary school. The gross enrollment ratio can exceed 100 percent because the numerator includes children outside the age range who either enrolled early or repeated grades. The ratio for high school and higher secondary school reflects the population weighted average of the ratios for the two cycles. We use different data sources for school enrollments and age enrollment ratios: the former assigns students to the highest grade offered at the school they attend (see footnote 3).

Table 2: Growth in primary and middle school enrollment and teaching staff and pupil-teacher ratios by district, Tamil Nadu 1977-92

District a/	Number of pupils and teachers in 1992 as a multiple of number in 1977		Pupil-teacher ratio in 1992	
	Pupils	Teachers	Absolute level	As multiple of level in 1977
Madras	1.25	1.09	46.8	1.14
Chengalpattu	1.44	1.05	50.5	1.37
Dharmapuri	1.45	1.10	53.1	1.32
Salem	1.25	1.04	44.8	1.19
Nilgiris	1.41	1.06	44.7	1.33
Pudukottai	1.59	1.23	54.2	1.29
Thiruchirapalli	1.30	1.05	43.9	1.25
Kanniyakumari	1.13	0.95	39.3	1.19
NA Ambedkar-Sambuvarcyar T.	1.35	0.98	48.7	1.38
SA Vallavar-Villapuram RP	1.38	1.03	52.1	1.34
Periyar-Coimbatore	1.30	0.97	49.1	1.35
Nagai QM-Thanjuvar	1.31	1.04	46.5	1.25
Dindigul-Madurai	1.37	1.05	46.2	1.30
Tuticorin-Thirunelveli	1.26	1.07	40.1	1.17
Sivagangai-Kamarajar-Ramanadhapuram	1.41	1.06	48.2	1.33
STATE AVERAGE	1.35	1.04	47.0	1.29

Source: tabulated from unpublished data provided by the Department of School Education, Government of Tamil Nadu.
a/ Data for some districts have been grouped to create a consistent time series since 1977.

Table 3: Growth in high school and higher secondary school enrollment and teaching staff and pupil-teacher ratios by district, Tamil Nadu 1980-92

District a/	Number of pupils and teachers in 1992 as a multiple of number in 1980		Pupil-teacher ratios in 1992	
	Pupils	Teachers	Absolute level	As multiple of ratio in 1980
Madras	2.32	1.45	49.3	1.61
Chengalpattu	2.51	1.46	44.5	1.72
Dharmapuri	3.33	1.54	49.6	2.17
Salem	2.30	1.42	40.7	1.62
Nilgiris	2.70	1.57	40.5	1.72
Pudukottai	3.47	1.73	48.2	2.01
Thiruchirapalli	2.24	1.37	38.0	1.64
Kanniyakumari	1.93	1.54	32.2	1.25
NA Ambedkar-Sambuvaroyar T.	2.74	1.32	44.7	2.07
SA Vallavar-Villapuram RP	2.50	1.40	43.6	1.78
Periyar-Coimbatore	2.12	1.35	40.7	1.57
Nagai QM-Thanjuvar	2.15	1.53	38.1	1.41
Dindigul-Madurai	2.24	1.42	40.7	1.58
Tuticorin-Thirunelveli	2.63	1.49	39.7	1.76
Sivagangai-Kamarajar-Ramanadhapuram	2.55	1.50	40.2	1.70
STATE AVERAGE	2.39	1.44	41.5	1.66

Source: tabulated from unpublished data provided by the Department of School Education, Government of Tamil Nadu.
a/ Data for some districts have been grouped to create a consistent time series from 1980.

Table 4: Selected characteristics of primary schools in rural Tamil Nadu, India, 1986/87

District a/	Percentage of schools		Percentage of classes
	With one room or none	With one teacher	Without blackboards b/
Chengalpattu	53.7	11.2	32.0
Dharmapuri	41.7	22.1	39.9
Salem	22.9	13.7	23.7
Nilgiris	10.9	4.1	22.2
Pudukottai	56.5	24.6	40.3
Thiruchirapalli	47.4	9.5	24.9
Kanniyakumari	11.5	0.1	11.5
NA Ambedkar-Sambuvaroya T.	49.6	8.0	31.5
SA Vallavar-Villapuram RP	59.3	7.8	34.5
Periyar-Coimbatore	30.9	12.6	19.9
Nagai QM-Thanjuvar	22.3	4.4	20.4
Dindigul-Madurai	38.1	8.3	14.2
Tuticorin-Thirunelveli	18.3	4.4	10.1
Sivagangai-Kamarajar-Ramanadhapuram	55.7	11.1	15.9
STATE AVERAGE	40.4	10.3	24.0

Source: tabulated from unpublished data supplied by the government of Tamil Nadu from the 1986/87 Fifth All-India Educational Survey.
a/ Data for some districts have been combined to correspond to the district groupings in previous tables.
b/ Includes classes with unusable blackboards.

Table 5: Candidates, passes and pass rates on the 10th grade examination, Tamil Nadu, selected years 1977-92

	1977	1986	1989	1992
Number of candidates	242,522	314,978	360,832	420,068
Number of passes	131,677	179,763	207,056	288,203
Passes as a percentage of candidates				
Both sexes	54.3	57.1	57.4	68.6
Girls	59.7	61.8	63.3	73.1

Source: tabulated from unpublished data supplied by the Government of Tamil Nadu.

Table 6: Determinants of the growth in tenth grade examination candidates and passes, Tamil Nadu 1977-92

	Number of Passes b/		Number of Candidates b/		Mean	Standard deviation
Number of Upper enrollments a,b/	-	-	.72 * (.09)	.83 * (.09)	189.4	64.2
Number of Candidates b/	1.05 * (.09)	.99 * (.09)	-	-	143.6	46.0
Middle school pupil/teacher ratio for each cohort	-1.51 * (.56)	-1.22 ** (.52)	-	-	41.8	7.0
Privately-managed schools as a percentage of all schools	-	.22 ** (.11)	-	-.08 (.15)	28.0	.16
Time c/	2.94 * (.57)	3.32 * (.55)	-.95 (.81)	-2.37 * (.78)	9.6	5.1
Constant	36.71	16.01	-3.30	9.34	-	-
District dummies	yes	no	yes	no	-	-
No. of Observations	105	90	105	90	-	-
Adjusted R^2	.90	.86	.87	.79	-	-

Source: based on unpublished time series data provided by the Department of School Education, Tamil Nadu.
Note: the figures in parentheses are heteroskedasticity-consistent standard errors are in parentheses. One star (*) on the regression coefficients denote statistical significance at the 1% level, and two stars (**) at the 5% level.

a/ Upper enrollments refer to enrollments in high school and higher secondary school.
b/ Indexed to base year 1977, with the data for 1977 set at 100. Because the level variables (i.e. number of passes, candidates, and enrollments) are indexed to a common base year the regression coefficients have a straightforward interpretation. For example, the first coefficient in the first column indicates that a one percentage point increase in the number of candidates (relative to the number in 1977) leads to a 0.99 percentage point increase in the number of passes on the tenth grade examination (relative to 1977).
c/ Number of years since base year 1977.

Appendix Table 1: Factors affecting households' decision to educate children, Tamil Nadu, India 1986/7

Family Characteristics		Proportion of children in the family with selected educational characteristics			
		Enrolled among those aged 8-17	Completed grade 5 among those aged 13-17	Enrolled in post-primary school among those aged 13-17 a/	Attended Standard 10 among those aged 16-17 a/
Number of children in the family		-.024 * (.006)	-.030 * (.009)	-.039 * (.010)	-.045 * (.016)
Boys as a percentage of children in the family		.138 * (.020)	.254 * (.022)	.291 * (.026)	.284 * (.038)
Father's education (years)		.018 * (.002)	.024 * (.004)	.028 * (.004)	.035 * (.006)
Mother's education (years)		.004 ** (.002)	.014 * (.004)	.015 * (.004)	.030 * (.013)
Family is part of extended household		.007 (.023)	.023 (.027)	.011 (.054)	.078 (.069)
Per capita consumption expenditure (10^{-3} rupees)		.190 ** (.076)	.471 * (.132)	.636 * (.165)	.479 *** (.286)
Village characteristics Adults' average years of education	Men	.012 * (.005)	.018 * (.006)	.005 (.008)	-.003 (.013)
	Women	.003 (.006)	.017 ** (.007)	.011 (.010)	-.018 (.018)
Average schooling expenses per child (10^{-3} rupees) b/	Primary	-.002 (.032)	-.036 ** (.018)	-	-
	Secondary	-	-	.073 ** (.037)	-.022 (.074
Proportion of children receiving free school meals	Primary	-.021 (.025)	.046 (.042)	-	-
	Secondary	-	-	-.004 (.037)	-.065 (.064)
Policy variables Distance to nearest school (km)	Primary	-.018 ** (.009)	.006 (.008)	-	-
	Secondary	-	-	-.009 ** (.004)	.002 (.005)
Nearest secondary school is public c/		-	-	.016 (.035)	.006 (.059)
Constant		.707	.371	.342	.129
District dummies		yes	yes	yes	yes
Adjusted R^2		.170	.225	.235	.254
Number of households		1591	1091	1156	488

Source: based on data from the 1986/87 National Sample Survey of Tamil Nadu, India.
Note: figures in parentheses are heteroskedasticity-consistent standard errors, with one star (*) denoting statistical significance at the 1% level, two stars (**) at the 5% level, and three stars (***) at the 10% level.
a/ The denominator for computing this variable includes only children who are eligible for post-primary or Standard 10 education by virtue of having attended the previous level of education.
b/ Computed as the average of reported expenditures for children in each sample village.
c/ A similar variable, "nearest primary school is public" was not used in the first two regression because the nearest primary school in the sample villages were invariably public schools.

Appendix Table 2: Regression variable means and standard deviations

		Unweighted household mean	Standard deviation
Dependent variables			
% Ever enrolled among those aged 8 & over a/		85.71	36.0
% Completed grade 5 among those aged 13-17 a/		62.98	48.29
% enrolled in post-primary school among those aged 13-17 a/		66.71	47.14
% enrolled in Standard 10 among those aged 16-17 a/		32.11	46.78
Household characteristics			
Number of children		2.30	1.16
Boys as a percentage of all children in family		0.56	0.36
Father's education (years)		3.99	3.97
Mother's education (years)		1.96	3.16
Family is part of extended household		0.12	0.32
Per capita consumption expenditure (rupees per month)		181.72	
Village characteristics			
Adult years of education	Men	3.38	2.12
	Women	1.45	1.58
Average schooling expenses per child (rupees per year)	Primary	90.29	296.29
	Secondary	227.53	214.33
Proportion of children receiving free school meals	Primary		
	Secondary	0.71	0.35
Policy variables			
Distance to nearest school (km)	Primary	0.15	0.86
	Secondary	2.57	3.32
Nearest secondary school is public		0.93	0.25

Source: 1986/87 National Sample Survey of Tamil Nadu, India.

Appendix Table 3: Percentage distribution of schools by management and finance, Tamil Nadu, 1977-92

District	Primary and middle school			High school and higher secondary school		
	Govt.	Aided	Unaided	Govt.	Aided	Unaided
Madras	60.1	39.8	0.1	33.6	63.9	2.5
Chengalpattu	85.2	14.6	0.2	78.7	20.6	0.7
Dharmapuri	98.6	1.4	0.0	98.3	1.6	0.1
Salem	91.0	8.9	0.1	85.3	14.4	0.3
Nilgiris	68.8	30.1	1.1	71.8	27.6	0.6
Pudukottai	92.8	7.2	0.0	86.0	13.5	0.5
Thiruchirapalli	83.8	16.2	0.0	73.3	26.5	0.2
Kanniyakumari	67.3	32.3	0.4	49.1	49.7	1.2
NA Ambedkar-Sambuvaroya T.	87.8	12.2	0.0	85.2	13.7	1.1
SA Vallavar-Villapuram RP	81.8	18.2	0.0	85.9	13.7	0.4
Periyar-Coimbatore	90.2	9.8	0.0	69.9	29.5	0.6
Nagai QM-Thanjuvar	78.6	21.3	0.1	70.9	28.6	0.5
Dindigul-Madurai	77.0	23.0	0.0	62.4	35.5	2.1
Tuticorin-Thirunelveli	41.8	58.2	0.0	48.9	46.7	4.4
Sivagangai-Kamarajar-Ramanadhapuram	75.7	24.3	0.0	62.7	34.9	2.4
STATE AVERAGE	78.7	21.2	0.1	70.8	28.0	1.2

Source: tabulated from unpublished data provided by the Department of School Education, Tamil Nadu.
Note: the distribution remained relatively stable between 1977 and 1992 we present the average distribution for the period.

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